

## Reliability and Factor structure of the General Health Questionnaire-12 among university students

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### ABSTRACT

**Introduction:** The 12-item General Health Questionnaire (GHQ-12) has been translated into many languages and widely used in different settings and countries. Its reliability and psychometric properties were extensively studied in many population groups which suggested that it measures psychological distress in multidimensional construct. **Objective:** The objective of this study was to assess the reliability and factor structure of the Bahasa Malaysia version of the GHQ-12 among university students attending a health program at a Malaysian public university. **Method:** The cross sectional survey was conducted on 306 undergraduate students aged between 18 to 27 years old who visited the booth set up for mental health screening at a health program. The screening was conducted using a self-administered, validated Bahasa Malaysia version of GHQ-12 questionnaire. **Results:** Using exploratory factor analysis, the Bahasa Malaysia version of GHQ-12 was found to have a three factor structures namely depressive symptoms, self-esteem and perceived abilities which accounted for 58% of the item variance. The overall Cronbach's alpha coefficient of the scale was found to be high (0.84) with each factor having acceptable inter-item consistency ranging from 0.61 to 0.82. **Conclusion:** The findings of the study show that the Bahasa Malaysia version GHQ-12 is reliable and has good structural characteristics. It can assess a few domains of the psychological status of university students. It also helps in providing more information on the domain which may become a focus target of intervention in the prevention of mental illness.

**Key Words :** GHQ-12, Bahasa Malaysia, Reliability, Factor Structure, University Students

### INTRODUCTION

The General Health Questionnaire (GHQ) has been used widely for measuring and detecting psychological morbidity in different settings and cultures. It was originally developed as a 60-items instrument and has been shortened to 30, 28 and then 12-item. Among these shorter versions, the 12-item GHQ is brief and easy to be completed. It has been favored by many clinicians and investigators as the shortest GHQ screening instrument for case detection. GHQ-12 has been found to be as reliable as the long version in detecting individuals with psychological distress.<sup>1</sup> It was translated into many different languages. The psychometric evaluation of these translated versions suggested that they were valid and reliable for local use with Cronbach's alpha coefficient values ranged from 0.75 to as high as 0.9 in a single dimension model.<sup>2-7</sup> However, many studies have shown that GHQ-12 measures psychological morbidity in more than one dimension, most common being in two or three dimensions.<sup>8-11</sup> The assessment of the adequacy of the factor structure of GHQ-12 as domains has been suggested to be better than a single dimensional model. Therefore, studies which identify the nature and factor structure of the GHQ questionnaire have been well received as it would contribute more in understanding the sufficiency of a scale measure in addition to its validity and reliability analysis.

Many studies conducted across different countries and populations have found that the GHQ-12 is a reliable scale with two or three factor solutions.<sup>5,6,12-14</sup> When looking at the studies from Asian countries, Doi & Minowa<sup>6</sup> in 2003 reported that the GHQ-12 yielded a two-factor solution of psychological distress (item 2,5,9,10 and 11) and social dysfunction (item 1,3,4,7 and 8) in Japan. An Iranian study<sup>12</sup> also found that the above two-factor structure was similar to those reported in the World Health Organization (WHO) study on psychological disorders in general health care.<sup>10</sup> A similar study in a general population in New Zealand<sup>13</sup> supported the two factor structure property of the 12 item GHQ while in a Spanish population<sup>5</sup> a three-factor structure was shown namely successful coping, self-esteem and stress. A more recent study by Rajabi et al<sup>15</sup> in 2009 yielded that two factor and three factor models of GHQ fitted the data better than the one dimensional model. In all the above studies, the subject studies were demographically diverse which include general populations, primary care attendants, industrial workers, people from different education levels (diploma to PhD) and youth of 18 years old in military service.

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Information on factor structures of GHQ-12 among university students who form part of a group of young population in Malaysia is limited. Previous studies only used GHQ-12 as a single dimension construct to detect probable cases of psychological stress in the community,<sup>16</sup> among medical students<sup>4,17-19</sup> and urological patients in a tertiary care centre.<sup>20</sup> Salina<sup>21</sup> in 2008 reported a cross-sectional survey of psychiatric morbidity among adults using the 28-item version of GHQ, as a part of the Malaysian Third National Health and Morbidity Survey (NHMS III).<sup>22</sup> It yielded data on insomnia, suicidal ideation as well as on the four domains of depression, anxiety, social dysfunction and somatic symptomatology. However, the emphasis of the study was more on the prevalence of psychiatric morbidity and suicidal ideation rather than the psychometric evaluation on the domains of GHQ-28.

Another study was carried out among university students in one of the Malaysian public universities to determine the reliability and factor structure of the GHQ 12 by Zulkefly & Baharudin<sup>23</sup> in 2010. Reliability analysis on a single dimension model of GHQ-12 showed satisfactory results in the study. There were three-factor structures identified: psychological distress, social and emotional dysfunction and cognitive disorder which jointly accounted for 51.9% of the variance.<sup>23</sup> However, there was no reliability analysis done on each separate domain. Male respondents were found to be overrepresented in the study and there was no additional information available about whether respondents were undergraduate or postgraduate students. In the light of this, the present study was conducted to examine the reliability and factor structure of the Bahasa Malaysia version of the GHQ-12 among undergraduate university students attending a health program at a public Malaysian university. In addition, GHQ-12 is still widely used in Malaysia as a tool to assess individuals' psychological health status. Therefore the need to explore its domain and factor structure properties in-depth would be valuable because specific psychological domains could be a focus target of intervention to prevent further psychological deterioration to the individuals in the studied population.

## METHODS

### Participants and Setting

Participants consisted of attendees of the Youthful Health Fair program that was held for three days in March 2011 at one of Malaysian public universities. This cross sectional survey was conducted amongst students who visited the booth set up for mental health screening during this program. The screening was done using a self-administered questionnaire which consisted of two parts; Part A (participants' socio-demographic data such as gender, age, ethnicity, year of study, study program, health-seeking behaviour in the past two weeks) and Part B (General Health Questionnaire 12 [GHQ-12]).

### Measurement

There are several versions of the GHQ, which have been extensively studied, translated into different languages and used in a number of countries including in the Malaysian Second and Third National Health and Morbidity Surveys (NHMSII and NHMS III)<sup>16,22</sup> in identifying national psychiatric morbidity. The shortest version of the GHQ is namely the GHQ-12, which is a self-administered questionnaire designed as a screening tool, and focuses on breaks in normal function rather than upon life-long stable traits. It detects disorders of a few weeks' duration and is sensitive to the detection of transient disorders. Its score can be interpreted in the form of a probability estimate of an individual being a case of psychiatric disorder.<sup>25</sup>

The GHQ-12 asks participants 12 questions about their mood and related symptoms or experiences of depression and anxiety, in the 4 week period before interview. The 12 items seek response with regards to the participant's ability to concentrate on their daily activities, loss of sleep over worries, whether they feel they are doing something meaningful, their capability to make decisions on things, feeling of being constantly under strain, and the ability to overcome difficulties. Other items included questions on whether they were able to enjoy their day-to-day activities, face up their daily problems, feeling unhappy and depressed, losing confidence in self or thinking of self as a worthless person. The final item asked whether the respondent feels reasonably happy, with all things considered. All the questions are followed by a choice of 4-point scale from 0 to 3, i.e. a graduated scale of positive to negative responses<sup>27</sup>. The total score ranges from 0 to 36 and a higher summated score suggesting worse conditions. The questionnaire can be completed in less than 5 minutes and thus is not taxing on the respondents.

### Procedure

The Bahasa Malaysia version of GHQ-12, translated from the original version for the NHMS II study<sup>16</sup> was used in this study. In NHMS II study, a total score of 2 and above (using a dichotomous scoring method) was used as

the cut-off point to define a probable case of common psychiatric disorders such as depression or anxiety disorder as recommended by literature<sup>26</sup>. Signed informed consent was obtained from all participants in the study before they undertook the assessment. Ethical approval was obtained from the Medical Research Ethic Committee of the Universiti Putra Malaysia.

### Statistical Analysis

Statistical Program Social Sciences (SPSS Version 19.0) was used to analyze data in this study. A number of statistical procedures were used such as descriptive statistics for data screening. Cronbach's alpha coefficients ( $\alpha$ ) were computed to evaluate the reliability of the GHQ 12 questionnaire. Factor analysis was also used to determine the factor structure of the GHQ-12. Prior to conducting the primary analyses, the data were examined for accuracy, missing values, outliers and multivariate assumptions. The number of missing values was minimal (<5%) and seemed to be distributed randomly across the remaining cases, therefore, mean substitution was employed where necessary. The Mahalanobis distance was used to identify multivariate outliers; using a cut-off of 0.001, no outliers were identified. The frequency distributions were further assessed using skewness and kurtosis statistics. Inspections of skewness and kurtosis indices indicated that departures from normality were not severe, so no variable transformations were deemed necessary.

## RESULTS

Three-hundred-and-six participants completed the GHQ-12 in this study. Age of the participants ranged between 18 to 27 years old with a mean of 21.67 (SD=1.72). Table 1 shows the profile of participants in this study. Majority (85%) were female, and of Malay ethnicity (65.7%). Almost half (45.8%) of the participants were freshmen (First Year students). In terms of health seeking behaviour, 5.6% of the participants consulted a doctor within the past two weeks due to medical reasons. The total summated score of GHQ-12 ranged from 5 to 31 points with a mean score of 14.31 (SD= 5.11).

**Table 1:** Profile of participants (N=306)

Profile of respondents	n	%
<b>Gender</b>		
Female	260	85.0
Male	46	15.0
<b>Ethnicity</b>		
Malay	201	65.7
Chinese	92	30.1
Indian	7	2.3
Others	6	2.0
<b>Year of study</b>		
First	140	45.8
Second	78	25.5
Third	57	18.6
Fourth	28	9.2
Fifth	3	1.0
<b>Health seeking behaviour within past 2 weeks</b>		
Yes	17	5.6
No	289	94.4
<b>Total (N)</b>	<b>306</b>	<b>100</b>

## Exploratory Factor Analysis

For the purpose of examining the structure of GHQ-12 scale, factor analysis using the extraction method of principal component analysis, was carried out with varimax rotation of the axes. The data met the Kaiser-Meyer-Olkin criteria for sampling adequacy of 0.844. The Bartlett's test of sphericity was acceptable ( $\chi^2 = 1089.24$ ,  $p = 0.0001$ ). Table 2 shows the GHQ-12 item descriptions, factor loadings and communality estimates. The results indicated that three factors had eigenvalues greater than one and these accounted for 58 percent of the item variance. Factor 1, labeled 'Depressive symptoms' represents items resemblance of primary depressive symptoms, such as 'lost much sleep over worries', 'constantly under strain', 'able to enjoy daily activities (not)', 'feeling unhappy and depressed', 'feeling reasonably happy (not)'. Factor 1 accounted for 37.25% of variance. The second factor revolves around issues about one's self confidence, thus labeled as 'Self-esteem'. These items are 'could not overcome difficulties', 'losing confidence', and 'think self as worthless' and they accounted for 11.72% of variance. The third factor reflects disturbances in cognitive and social areas and it is labeled as 'Perceived abilities'. The items under these factors are 'playing useful part (not)', 'face up to problems (not)', 'capable of making decisions (not)' and 'ability to concentrate (not)'. Factor 3 accounted for 9.02% of variance.

## Internal consistency of GHQ-12

Cronbach's coefficients were calculated to examine the reliability of these domains and the alphas obtained reflect moderate to high inter-item consistency for each domain (Table 2). The overall reliability assessment showed a reasonably high inter-item consistency,  $\alpha = 0.84$ . The values of Cronbach's coefficients for each factor are 0.82 (Factor 1), 0.73 (Factor 2) and 0.61 (Factor 3). The item total statistics for GHQ-12 reliability analysis is shown in Table 3.

**Table 2:** Factor Structure of the GHQ-12

Item	Factor 1 (Depressive Symptoms)	Factor 2 (Self- esteem)	Factor 3 (Perceived abilities)	Communalities
(2) Lost much sleep	0.76			.60
(9) Feeling unhappy & depressed	0.74			.71
(12) Feeling reasonably happy	0.69			.64
(5) Under strain	0.69			.58
(7) Enjoy normal daily activities	0.67			.55
(10) Losing confidence		0.84		.78
(11) Thinking of self as worthless		0.84		.74
(6) Could not overcome difficulties		0.45		.40
(3) Playing useful part			0.68	.56
(8) Face up to problems			0.67	.58
(4) Capable of making decisions			0.63	.48
(1) Able to concentrate			0.56	.34
Percent Variance	37.25	11.72	9.02	
Cronbach's Alpha	0.82	0.73	0.61	
Cronbach's Alpha for 12 items	0.84			

**Table 3:** Item-Total Statistics of GHQ-12 reliability analysis

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
GHQ1	12.8627	23.417	.343	.840
GHQ2	13.4837	21.837	.464	.833
GHQ3	13.3137	23.318	.321	.843
GHQ4	13.1111	22.702	.481	.831
GHQ5	12.6863	21.593	.593	.822
GHQ6	13.1013	22.432	.500	.829
GHQ7	13.0163	22.593	.489	.830
GHQ8	13.0784	22.532	.533	.827
GHQ9	12.9837	21.223	.617	.820
GHQ10	13.2745	21.505	.574	.823
GHQ11	13.5261	22.257	.487	.830
GHQ12	12.9771	21.334	.673	.816

## DISCUSSION

In general, the study identified three factor domains in GHQ-12 scale namely depressive symptoms, self-esteem and perceived abilities and each domain was found to be reliable with moderate to high internal consistency with Cronbach's coefficients of 0.82, 0.73 and 0.61 respectively. This finding provides support for three factor structure of GHQ-12. Similarly, Zulkefly & Baharudin<sup>23</sup> in 2010 identified three factor structures of GHQ-12 among Malaysian university students and the factor domains were psychological distress, social and emotional dysfunction and cognitive disorder. There were two items namely 'feeling unhappy and depressed' and 'feeling reasonably happy (not)' in GHQ-12 that were categorized into one similar factor domain in both studies. The domain was depressive symptoms factor in the present study and psychological distress factor in the previous study. This is reasonably relevant because the item 'feeling unhappy and depressed' in GHQ-12 has been characterized as one of the core depressive symptoms that have been classified in Diagnostics and Statistical Manual IV- Text Revision (DSM IV-TR).<sup>28</sup>

The result of the present study also echoed the finding of a study on young people aged 16-25 years old in Australia.<sup>8</sup> Graetz<sup>8</sup> in 1991, also showed almost identical result of GHQ-12 as three factor structure namely anxiety, social dysfunction and loss of confidence factors. Three items in depressive symptoms factor of the present study were replicated in the previous study's anxiety factor. The items were 'feeling unhappy and depressed', 'lost much sleep' and 'under strain'. All four items in perceived abilities factor in the present study were also consistent with social dysfunction factor in the Australian study which consisted of 'playing useful part', 'face up problems', 'capable of making decisions' and 'able to concentrate'. Two of the items which consisted of 'losing confidence' and 'thinking of self as worthless' were replicated in one of the factors in both studies.

On the contrary, some previous studies also found GHQ-12 as two factor structure. A study in Japan<sup>6</sup> and Iran<sup>2</sup> had shown very similar result of two factor structure of social dysfunction and psychological distress. Iwata et al<sup>29</sup> in 1988 stated a similar two factor structure for Japanese workers. Similarly Politi et al<sup>9</sup> in 1994; identified a two-factor solution namely general dysphoria and social dysfunction among Italian young men while Kilic et al<sup>30</sup> in 1997; reported similar two-factor solution which were anxiety/depression and social dysfunction among Turkish primary care patients. Picardi et al.<sup>32</sup> found the GHQ-12 consisted both two (general dysphoria and social dysfunction) and three (social dysfunction, anxiety and self-esteem) factor solution. Based on the findings of these studies, social dysfunction factor has consistently appeared in GHQ-12. Despite the different nomenclature of the factors, the items such as 'playing useful part', 'face up to problems', 'capable of making decisions' and 'able to concentrate' was consistently found in the social dysfunction domain of the previous studies. These items were also replicated in the perceived abilities factor of the present study.

There were some explanations offered as to why different factor structures were found in GHQ-12 measures. One of the reasons was that most of the studies examine factor structures of the scale on a very diverse population groups from a normal healthy population to a selected homogenous group such as attendees of a primary health care setting. However, this was proven otherwise by the consistent findings of three factor structures found in young population of similar age background in Graetz<sup>8</sup> in 1991 and Zulkefly & Baharudin<sup>23</sup> in 2010 which was later replicated in the



present study. Other possible reason includes the possibility of aspects of clinical and health-related quality of life of the respondents in relation to the GHQ-12 scores that may affect the factors loading of the scale. The factors were found to be strongly correlated and therefore in some studies, the scale items were loaded differently under different nomenclatures.

With regards to the internal consistency, the results of the study also showed a consistent finding with other previous ones that GHQ-12 has high overall inter item reliability (0.85) as a single dimension measure. This finding is supported by previous studies in Japanese general adult population ( $>0.8$ )<sup>[6]</sup> and Iranian population (0.87)<sup>[12]</sup>. Salama-Younes et al<sup>[31]</sup> in 2009 found similar Cronbach's alphas for a French population. The result has also been consistent with studies in Spanish (0.78)<sup>[5]</sup> and Italian populations (0.81)<sup>[9]</sup>. Therefore, it indicates that GHQ-12 is an internally reliable measure of psychological wellbeing of individuals across different demographic backgrounds and robust in various social and cultural settings.

The present study addresses the practical and clinical implications in relation to the utility of GHQ-12 as a screening tool in non psychiatric populations with diverse cultural settings. The ability of GHQ-12 scale to discriminate between those with or without mental disorder was not demonstrated in the present study as discriminant validity was not performed on GHQ-12 against any gold standard scales of similar measures. However, the consistent evidence of distinct factor domains such as psychological symptoms and perceived abilities in GHQ-12 with adequate reliability scores indicates that these factors represent valid psychopathology of the population sample. This in turn, may help to identify individuals who are more susceptible to develop psychological disorder in future and hence preventive measure could be taken into consideration.

The adaptability of these three factor domains of GHQ-12 in clinical practice are not verified in the present study. Even there are three distinct factors identified, it may have been difficult to distinguish them in practice because all these factors are somehow correlated. This is in fact explained by Gao et al (2004). Their study found that the three factor domains of GHQ-12 did not appear to give additional information on psychological functioning of individuals in relation to clinical variables and health related quality of life as compared to one-dimensional measure.<sup>33</sup> However, it was acknowledged that the small study sample size and homogeneity of their study population who were mainly from clinical cases might limit the result of the study. It is recommended that in a future study all three factor scores are compared with major clinical diagnoses in order to ascertain their clinical use.

The results of the study should be viewed in the lights of a few of its limitations. The size of the sample population was relatively smaller as compared to previous studies and it was conducted only in one of the local public universities. Therefore, it limits the generalizability of the findings. The sample also was primarily consisted of first year students' population who may have confounded the results as such they overrepresented the group with less psychological distress. Despite these limitations, the present study was able to provide consistent evidence that GHQ-12 is a reliable scale for measuring psychological distress and found to have three factor structures among young people. In future, it is recommended that a confirmatory factor analysis will be conducted in order to confirm the goodness-fit of the data and validate further on the indicators for each factor structure. Besides that, conducting specificity and sensitivity analysis also could improve the discriminant validity to investigate the feasibility of GHQ-12 to clinical or non-clinical population.

In conclusion, the multidimensional properties of GHQ-12 help to distinguish between psychological, perceived abilities and self esteem domains which somehow reflect psychological health status of young people in general. Although its usefulness in clinical practice is not tested, it may contribute to the identification of those who are susceptible to psychological disorder. Henceforth, it is a useful screening tool for detecting young people who are at risk of developing mental illness.

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